In the claims

1-20. (Previously canceled)

21. (Currently amended) An automated method for analyzing neurite outgrowth comprising

a) providing an array of locations comprising cells, wherein the cells possess at least a first luminescently labeled reporter molecule that reports on cell location, and at least a second luminescently labeled reporter molecule that reports on neurite outgrowth;

b) obtaining a nuclear image from the at least first luminescently labeled reporter molecule and a neurite image from the at least second luminescently-labeled reporter molecule;

c) automatically identifying cell bodies from the nuclear image;

d) automatically identifying neurites extending from the cell bodies [~~from the neurite image~~]**, wherein identifying neurites extending from cell bodies comprises the steps of:**

I) generating a reservoir image from the neurite image; and

II) identifying positive pixels in the reservoir image that are not present in the cell bodies, wherein such positive pixels belong to neurites extending from cell bodies; and

e) automatically determining one or more neurite features selected from the group consisting of:

i) Total neurite length from all cells;

ii) Total number of neurite branches from all cells;

iii) Number of neurites per cell;

iv) Number of neurites per positive neuron;

v) Neurite length from each cell;

vi) Neurite length per positive neuron;

vii) Neurite length per neurite;

viii) Number of cells that are positive for neurite outgrowth;

ix) Percentage of cells positive for neurite outgrowth;

x) Number of branches per neuron; and

xi) Number of branches per neurite;

wherein the features provide a measure of neurite outgrowth from the cell bodies.

22. (Previously amended) The method of claim 21, wherein identifying cell bodies comprises the steps of:

A) generating a kernel image from the nuclear image;

B) performing conditional dilations of the kernel image to identify the cell body.

23. (Canceled)

24. (Currently amended) The method of claim **22** [~~23~~], further comprising

(a) performing one conditional dilation of the kernel image to acquire a dilation image;

(b) determining a set of nodes from the dilation image;

(c) linking together connected nodes; and

(d) repeating steps (a)-(c) until an entire neurite length has been traced.

25. (Previously amended) The method of claim 24, further comprising repeating steps (a) through (d) at multiple time points.

26. (Previously amended) The method of claim 21 further comprising contacting the cells with a test compound, and determining an effect of the test compound on neurite outgrowth from the cell bodies.

27. (Previously amended) The method of claim 26, further comprising contacting the cells with a neurotoxin either before, after, or simultaneously with the test compound.

28. (Previously amended) The method of claim 26, further comprising contacting the cells with a control compound known to stimulate neurite outgrowth, and determining whether the test compound inhibits the control compound from inducing neurite outgrowth from the cell bodies.

29. (Previously amended) The method of claim 21, further comprising repeating steps b) through e) at multiple time points.

30. (Previously amended) The method of claim 21 wherein the first luminescently labeled reporter molecule comprises a DNA binding compound.

31. (Previously amended) The method of claim 21 wherein the second luminescently labeled reporter molecule is neuron-specific.

32. (Previously amended) The method of claim 31 wherein the neuron-specific luminescent reporter molecule comprises a molecule selected from the group consisting of neurofilament proteins, βIII-tubulin, ciliary neurotrophic factor, and antibodies specific for neurofilament proteins.